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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

TSN2201 – COMPUTER NETWORKS

(All sections / Groups)

11 MARCH 2020
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **SIXTEEN** pages (excluding this page) with **FIVE** questions.
2. Answer all **FIVE** questions. Each question carries **20 marks** and the distribution of the marks for each subdivision is given. Maximum allotted are **100 marks**.
3. Please write all your answers in the Question Paper itself.

*Answer all **FIVE** questions. Each question carries 20 marks and the distribution of the marks for each subdivision is given.*
(5 × 20=100 marks)

QUESTION 1:

a. The topology of a network is a geometric representation of the relationship of all the links and nodes to one another. Answer the following questions with respect to the network topology.

(i) State any **TWO advantages of Star Topology** compared to Mesh Topology.
(2 marks)

(ii) Assume that there are 10 devices in the network. Identify the number of **duplex-mode links and number of input/output ports** required for each of the following.

- Star Topology	(2 marks)
- Mesh Topology	(2 marks)

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b. Identify which layer in the TCP/IP Protocol Suite is responsible for each of the following. **(4 marks)**

- (i) Providing Reliable process-to-process delivery
- (ii) Determining Route
- (iii) Handling frames between adjacent nodes
- (iv) Providing user services such as email and file transfer

c. Answer the following questions with respect to the performance of a network.

(i) Explain briefly what is **throughput**. Assume a network with bandwidth of 100 Megabits per second (Mbps) can pass only an average of 80000 frames per 60 seconds, with each frame carrying an average of 24000 bits. Calculate the **throughput** of this network. **(2 marks)**

(ii) Explain briefly what is **propagation time**. Assume the distance between sender and receiver is 24000 kilometre (km) and propagation speed is 2.4×10^8 meter/second (m/s), calculate the **propagation time**. **(2 marks)**

Continued...

d. Identify the purpose of the following with respect to transmission media.

- (i) Twisting in Twisted-pair cable.
- (ii) Cladding in an optical fiber.

(4 marks)

e. Bluetooth defines two types of networks: piconet and scatternet. State the difference between them. **(2 marks)**

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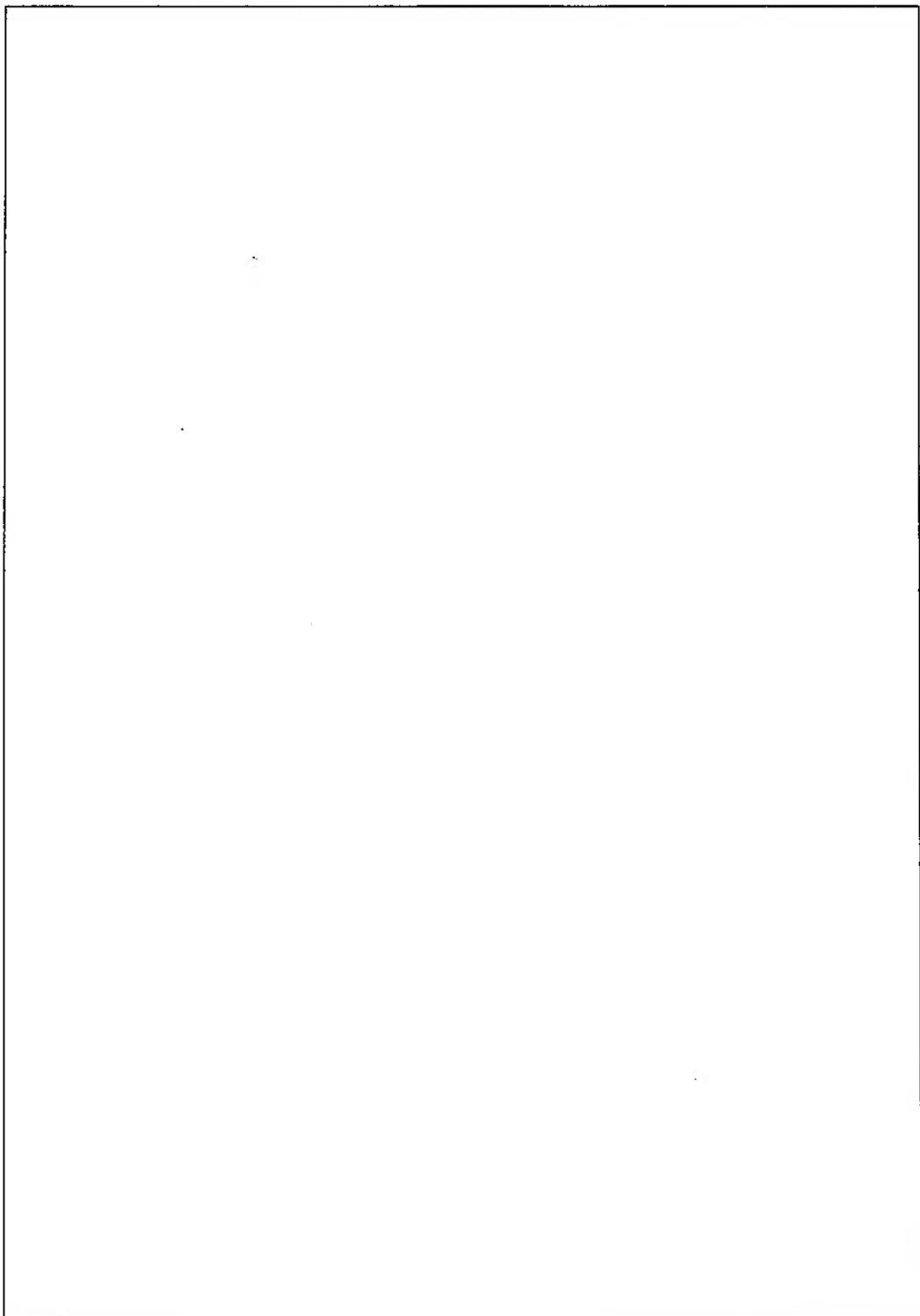
QUESTION 2:

a. Assume that sender and receiver have agreed on the usage of **Cyclic Redundancy Check (CRC) code and the divisor 10111**. Answer the following.

(i) Sender needs to send the data-word 10101101. Identify the Check Bits (Remainder) and the **Code Word** that will be generated at the **sender site**. **(4 marks)**

(ii) Receiver receives the code word with an error in the Most Significant Bit (MSB), Identify the **syndrome (Remainder)** at the receiving end. **(3 marks)**

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b. Answer the following questions related to flow and error control protocols for noisy channels.

- (i) State the **disadvantage** of Stop-and-Wait Automatic Repeat Request (ARQ) protocol compared to Go-Back-N ARQ protocol. **(2 marks)**
- (ii) Assume 4-bits are used for the sequence number field in the header of the frame. What is the maximum size of **send and receive windows** for each of the following protocols. **(2 marks)**
 - Stop-and-Wait ARQ
 - Go-Back-N ARQ
- (iii) For improving the efficiency of bidirectional flow and error control protocols, a technique called **piggybacking** is used. State what is meant by **piggybacking**? **(2 marks)**

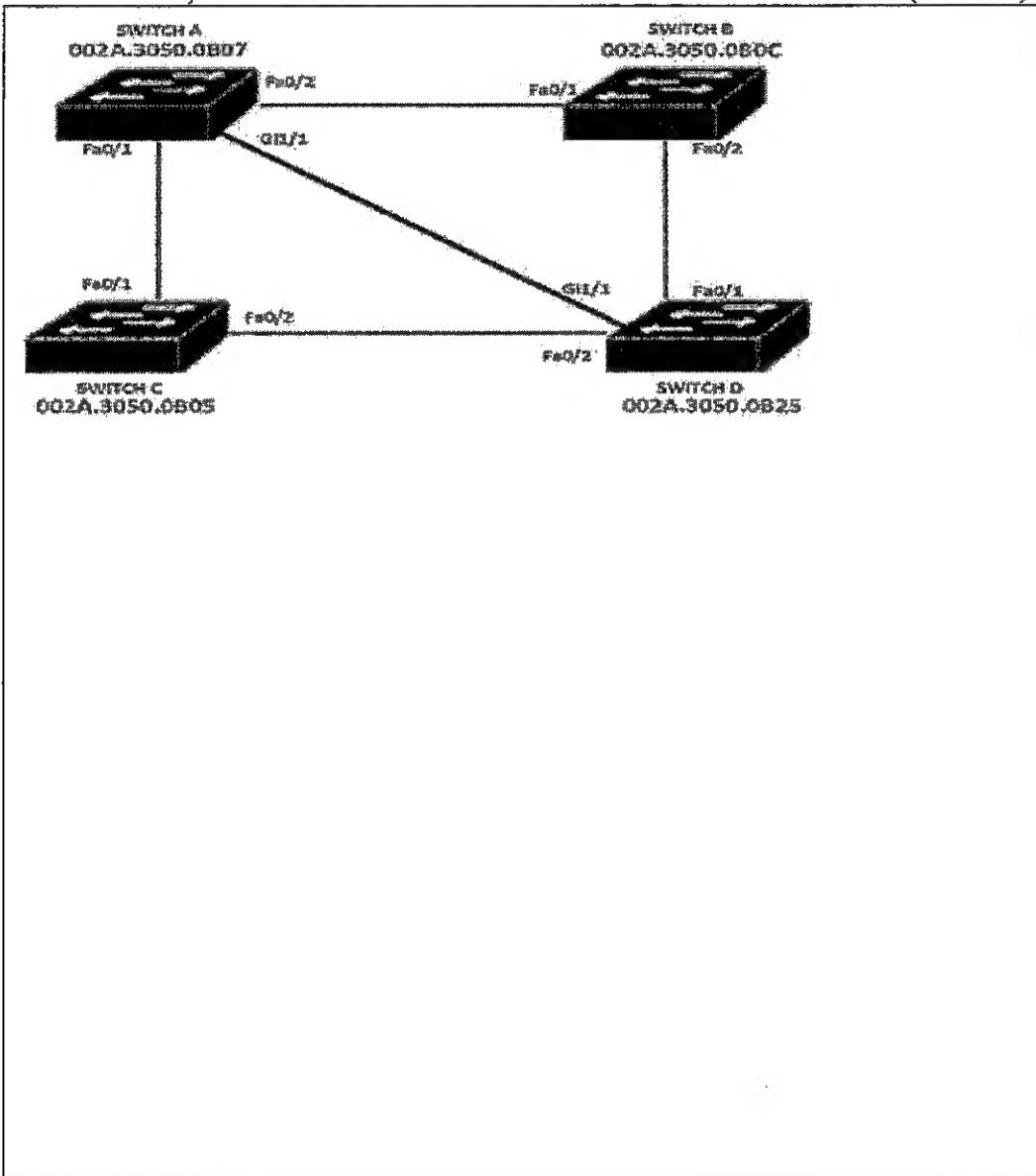
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c. Assume **Spanning Tree Protocol** is used to construct a loop free shortest path network and eliminate problems associated with redundant topology.

Identify the following in the switched network given below and mark them in the diagram and briefly explain your choice:

- (i) Root Bridge/Switch
- (ii) Root Ports
- (iii) Designated Ports
- (iv) Non-Designated ports (Blocked Ports)

Assume all links have equal path cost of 19 and all switches have default priority value of 32,768. (7 marks)



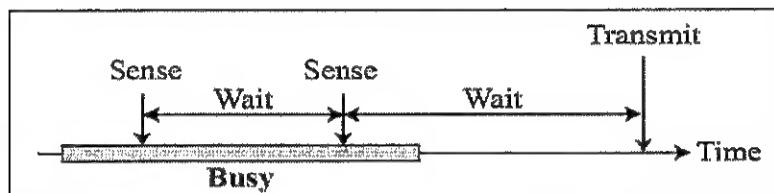
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QUESTION 3:

a. Answer the following questions with reference to Carrier Sense Multiple Access (CSMA) protocol at the data link layer.

(i) The persistence strategy used in Carrier Sense Multiple Access (CSMA) protocols defines the procedures for a station that senses a busy/idle medium. Briefly explain the non-persistent strategy and state its advantage and disadvantage. You can use the following diagram to explain.

(3 marks)



(ii) Assume the bandwidth of the network using CSMA/CD is 100Mbps. If the maximum propagation time is 100 microseconds, what is the minimum size of the frame required (in bits) to detect collisions. **(3 marks)**

Continued...

b. With Reference to **Code-division multiple access (CDMA)** protocol, answer the following:

Two Basic rules for creating Walsh Tables for generating chip sequences are given below.

$$W_1 = \begin{bmatrix} +1 \end{bmatrix} \quad W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & \overline{W_N} \end{bmatrix}$$

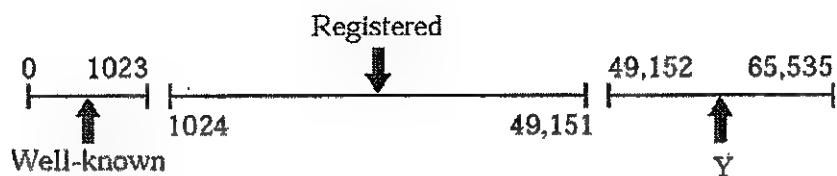
(i) Identify the chip sequence for (i) two station network and (ii) four station network **(2 marks)**

(ii) Assume that there are four stations that are connected to the same channel and the data sent by each station is as below. Identify the total data in the channel using the identified chip sequence and encoded data. **(2 marks)**

Station	Data sent	Encoded Data (d)
1	0	-1
2	1	+1
3	No signal (idle)	0
4	1	+1

Continued...

c. The below figure shows the IANA ranges for port numbers



- (i) What is the size of the port number in transport layer? (1 mark)
- (ii) Name the port range Y. (1 mark)
- (iii) POP3 uses specific port number to retrieve emails, which port range it belongs to? (1 mark)

d. What are the TWO address allocation types in **DHCP**? Describe briefly each of them. (3 marks)

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e. What is connectionless service in transport layer? Is a name query with DNS protocol a connectionless service? Explain your answer.

(4 marks)

QUESTION 4:

a. How many bits are assigned to an IPv6 address? Is the address **2021: db8:: 1234: 2566::** a valid IPv6 address? Explain your answer.

(3 marks)

b. Explain briefly the difference between **inter-domain** and **intra-domain** routing protocols. Give one example for each of them.

(4 marks)

Continued...

c. You are granted with a block of IP addresses, beginning with **209.10.150.0/25**. You need to create 4 subnets to be assigned to 4 departments. The number of hosts in each department is shown in the following table. Apply **VLSM** (Variable Length Subnet Mask) addressing scheme to solve this problem.

Department	Number of Hosts
Account	6
Business	33
Finance	19
Legal	5

(i) How many IP addresses are available in this IP block of 209.10.150.0/25? **(1 mark)**

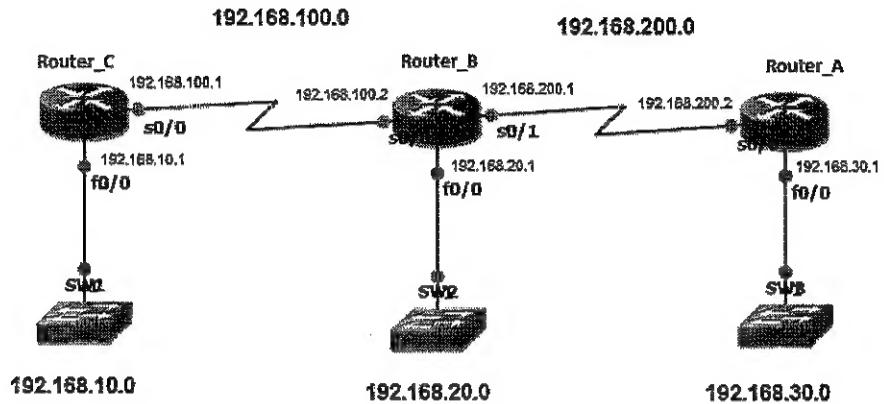
(ii) What is the subnet mask for the largest department? Find the first and last IP addresses for this subnet. **(3 marks)**

(iii) Find the subnet mask for the Finance department. What is the IP address range for this department? **(2 marks)**

(iv) Find the IP address ranges for Account and Legal departments. **(2 marks)**

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d. The following network uses **RIP** routing. Write down the routing information found in the routing table of Router_A. The routing table consists of three columns, i.e. destination, hop, and next. (5 marks)

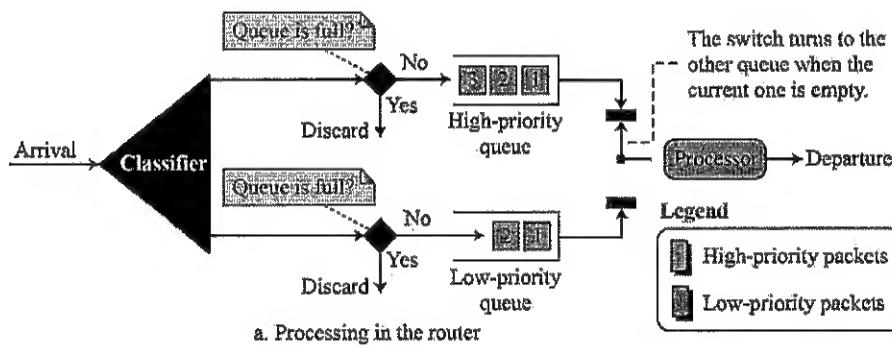


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QUESTION 5:

a. State the TWO broad categories of **congestion control policy**. What is the main difference between both categories? **(4 marks)**

b. Answer the following questions by referring to the figure below.



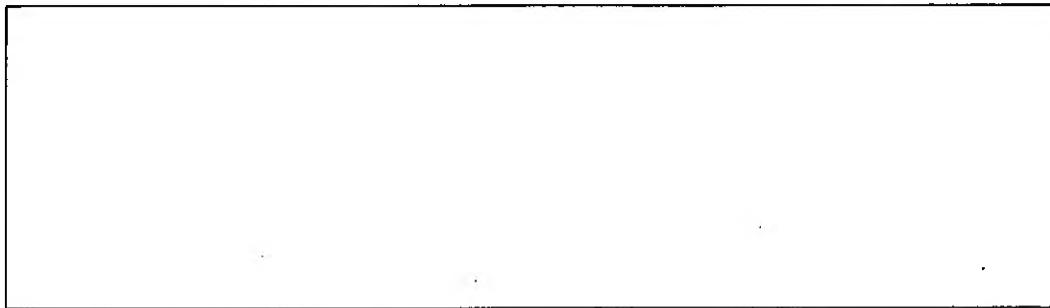
(i) What is **scheduling** in networking? **(1 mark)**

(ii) State the name of the above scheduling technique. **(1 mark)**

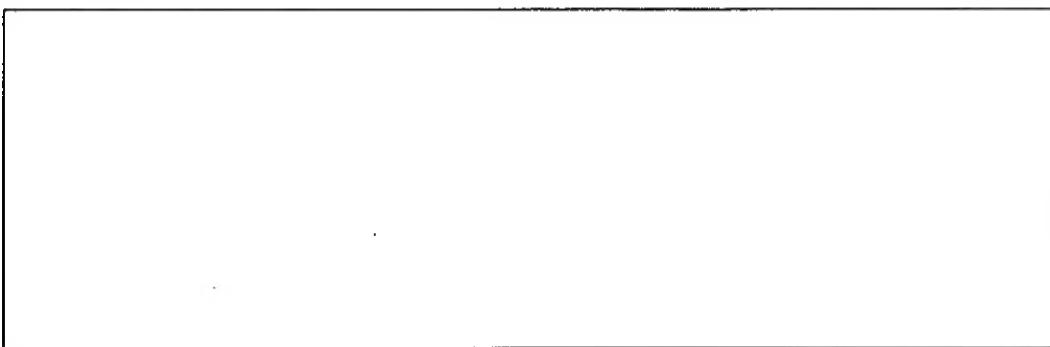
(iii) Describe briefly how this scheduling technique works. **(2 marks)**

(iv) What will happen if the average arrival rate is higher than the average processing rate? **(1 mark)**

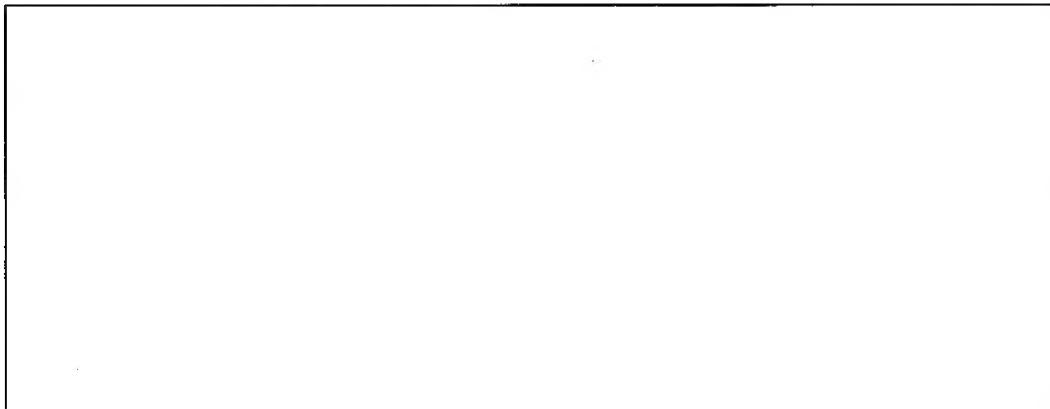
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c. Explain briefly the **Push and Pull protocols** in email. Give an example for each of them. **(4 marks)**

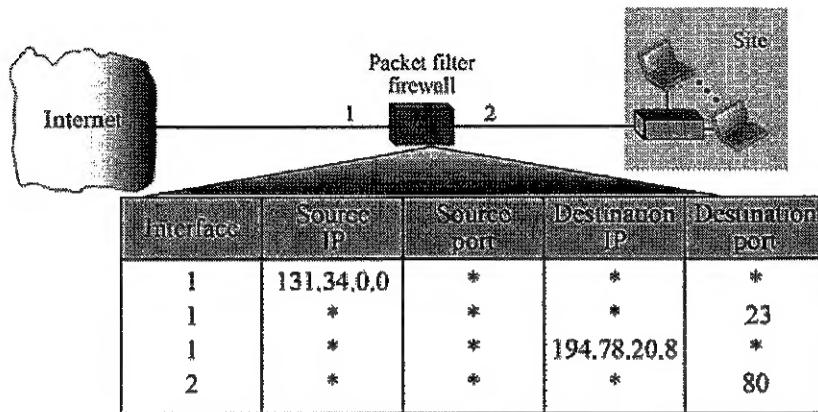


d. State the **THREE threats** in computer security. Give one example of security attack for each of them. **(3 marks)**



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e. The figure below shows a **packet-filter firewall**, answer the following questions.



(i) On which layers (TCP/IP model) does this firewall perform the filtering? (2 marks)

(ii) Will an incoming packet (source IP: 171.34.0.0, source port: 2058, destination IP: 193.78.20.8, destination port: 23) be blocked at interface 1? Explain your answer. (2 marks)

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